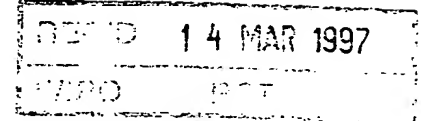


PATENT COOPERATION TREATY

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RCA 87865	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US 96/ 02642	International filing date (day/month/year) 08/03/1996	Priority date (day/month/year) 30/03/1995
International Patent Classification (IPC) or national classification and IPC H04N7/173		
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


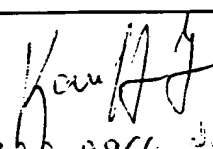
2. This **REPORT** consists of a total of 42 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consists of a total of 7 sheets.

3. This report contains indications and corresponding pages relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 24/10/1996	Date of completion of this report 12.03.97
Name and mailing address of the IPEA/  European Patent Office D-80298 Munich Tel. (+ 49-89) 2399-0, Tx: 523656 epmu d Fax: (+ 49-89) 2399-4465	Authorized officer  Telephone No. 2399-8964

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

I. Basis of the report

1. This report has been drawn up on the basis of (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.):

☐ the international application as originally filed.

☒ the description, pages 3 to 16 _____, as originally filed,
pages _____, filed with the demand,
pages 1, 2 and 2a _____, filed with the letter of 25.02.97,
pages _____, filed with the letter of _____,

☒ the claims, Nos. _____, as originally filed,
Nos. _____, as amended under Article 19,
Nos. _____, filed with the demand,
Nos. 1-4, 6-13, 15, 16, 20, 21 _____, filed with the letter of 25.02.97,
Nos. _____, filed with the letter of _____,

☒ the drawings, sheets/fig 1/4 to 4/4 _____, as originally filed,
sheets/fig _____, filed with the demand,
sheets/fig _____, filed with the letter of _____,
sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____.

☒ the claims, Nos. 5, 14, 17-19 _____.

☐ the drawings, sheets/fig _____.

3. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

In claim 1, reference is made to "differing resolution values" in connection with different speeds of reproduction. The originally filed application clearly teaches that the resolution (whatever this term actually defines) is chosen so as to be always lower in non-normal play modes than in the normal image

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

play or reproduction mode (see in particular figure 1 and corresponding description), in order to save memory space used for storing image program data representing non-normal reproduction speed images. Since claim 1 also encompasses resolutions in non-normal play modes which are higher than resolution associated to the normal play mode, subject-matter which extends beyond the content of the application as filed has been introduced into the application.

Similar comments are applicable in connection with the "differing record sizes" alluded to in claim 9, since according to the description, the record sizes corresponding to non-normal play modes are smaller than those associated to the normal play mode, for saving memory space required for storing the corresponding image data. Furthermore, the feature of decoding the selected image information has been deleted in claim 9, further extending the scope of protection covered by the claim.

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application,

☒ claims Nos. 1-4, 6-8 _____

because:

☐ the said international application, or the said claims Nos. _____ relate to the following subject matter which does not require an international preliminary examination (specify):

☒ the description, claims or drawings (indicate particular elements below) or said claims Nos. 1-4, 6-8 _____ are so unclear that no meaningful opinion could be formed (specify):

see paragraph VIII of the present report

☐ the claims, or said claims Nos. _____ are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for said claims Nos. _____

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

The alleged inventions defined in independent claims 1, 9 and 21 are not linked by a single common concept, whether this concept is considered to be inventive or not. In particular, claim 1 defines a method for reproducing a plurality of video programs involving jumping to different ones of said programs at predetermined jumping points and reproducing at various differing resolutions; claim 9 defines an apparatus for reproducing video programs represented by stored records having differing sizes; claim 21 defines an apparatus for reproducing compressed digital images at different speeds, wherein tables for generating addresses for locating transducer means at various program selections are used.

No common feature representing a single inventive contribution to the known art represented by the documents cited in the International Search Report is identifiable in these claims. In particular, the method for determining the switching points

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

between the different streams, which according to the teachings of the description represents an important part of the alleged invention(s) (see in that respect page 5, lines 30 to 36, page 7, lines 20 to 23, page 8, lines 25 to 28), and which is represented by the use of tables of entry points in claim 21, has not been set out in claims 1 and 9.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☐ all parts.

☐ the parts relating to claims Nos. _____.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

Intern. application No.

PCT/US96/02642

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims 9-13, 15, 16, 20, 21_____	YES
	Claims _____	NO
Inventive Step (IS)	Claims 21_____	YES
	Claims 9-13, 15, 16, 20_____	NO
Industrial Applicability (IA)	Claims 1-4, 6-13, 15, 16, 20, 21_____	YES
	Claims _____	NO

2. CITATIONS AND EXPLANATIONS

Claims 9-13, 15, 16 and 20:

Notwithstanding the fact that independent claim 9 lacks clarity (see in that respect paragraph VIII of the present International Preliminary Examination Report), it appears that the claim lacks an inventive step vis-a-vis the art known from EP, A, 0625857.

This document discloses (see in particular figure 1; column 10, line 38 to column 11, line 8; column 15, line 51 to column 16, line 34) an apparatus comprising means for storing and means for linking as defined in claim 9 of the present application. The prior art document does not explicitly refer to "records of differing sizes for reproducing at a plurality of speeds" (whatever is actually meant by such expression). However, a skilled person knowing the teachings of the document, would readily realise that in the prior art apparatus disclosed the data stored additionally to the data representing the images at normal reproduction speed, and representing the visual fast forward and fast rewind display operations occupies less memory than the "normal" image data, since the retrieval speed of the

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

data out of the memory is kept constant independently of the visual mode selected by the user (see column 10, lines 46 to 50), which implies that the number of frames stored for the fast forward or fast rewind visual reproduction speed in the respective records is less than the number stored for normal reproduction, for a given sequence of successive frames (or a given period of original normal speed images).

Thus, although not explicitly disclosed in the prior art document identified above, providing records of "differing sizes" in connection with visual non-normal reproduction speeds is at least suggested in the prior art.

Claim 9 therefore, and in the absence of any detail specifying the linking of the encoded signal records of each set, does not reveal clearly an inventive contribution to the known art, and consequently lacks an inventive step vis-a-vis the document EP,A,0625857.

The same conclusion is applicable to claims 10-13,15,16 and 20. The subject-matter of claims 11, 15 and 16 is suggested in the prior art document identified above (in connection with claim 11, see column 11, lines 4 to 8). The subject-matter of claim 20 represents an obvious measure a skilled person would evidently adopt in order to switch between programs to be reproduced with no loss or with minimized loss of video information (no information loss gap at reproduction during switching from one program record to another).

The use of tables of predetermined points by the reproducing apparatus for linking corresponding "entry points" in records representing differing visual reproduction speeds is suggested in EP,A,0625897, which mentions the use of tables defining same moments in the video images sequences corresponding to the various reproduction speed records (column 11, lines 1 to 8 : memory allocation tables).

Thus claims 12 and 13 do not seem to add anything of inventive significance to claim 9.

Claim 21:

The combination of features of independent apparatus claim 21 appears to be neither known nor obviously derivable from the prior art known from the International Search report. In particular, the use of tables of predetermined addresses for determining predetermined jump points linking compressed program records all relating to a same sequence of video images, at program selection occurrences, the tables being stored together with the program records and used at reproduction for generating addresses within the selected program records, the play speed chosen by the user being obtained by appropriately locating, according to the generated addresses, the transducing means, is not suggested in the documents alluded to above. Claim 21 therefore meets the requirements of Article 33(2) and 33(3) of the PCT.

All claims on file meet the requisite of industrial applicability in the sense of Article 33(4) PCT, since image reproduction devices based on stored compressed image data are widely known and used in imaging techniques, such as in the fields of television or computer generated image displays.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

Intern. application No.

PCT/US96/02642

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The independent claims 1, 9 and 21 are not drafted in the appropriate two-part form according to the provisions of rule 6.3(b) of the PCT.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 1:

In claim 1, it is not clear how the "differing resolution values" mentioned in last paragraph of the claim are related to the selection process, to the digitally encoded signals stored in the storage medium, and to the reproduced images. In particular, it is not clear whether the data stored representing images corresponding to different reproduction speeds other than normal speed is stored with differing resolution, in particular lower resolution, so as to save memory space, or the selecting process is carried out so as to obtain, e.g. by subsampling, differing resolution values of the reproduced images at non-normal play speed, from corresponding (normal resolution) data stored.

Furthermore, it is not clear whether the resolution alluded to relates to the stored image (spatial resolution), or to the reproduced image (spatial and/or temporal resolution), or to the data amount stored.

Furthermore, the jumping process alluded to in claim 1 has not been clearly defined. In particular, the claim is silent as to how the predetermined jump points are determined, although according to the teachings of the description such addressing process seems to represent an essential feature of the alleged invention: are the "jumping points" stored on the medium together with the image program data, or read out from control tables at reproduction ?

Due to the above mentioned deficiencies of claim 1, the supposed contribution, if any, to the art known from the documents cited in the International Search Report (in particular EP,A,0625857) cannot be readily ascertained from the present statement of claim.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

Claim 9:

In claim 9, it is not clear what the expression "having records of differing sizes" means: does it mean that the "size" of each record is different within each set, or within and between sets ? Furthermore, it is not clear to what the "size" alluded to actually relates: number of pixels or images corresponding to a record, or number of bits (storage space) used for actually encoding it ?

Furthermore, it is not clear in claim 9 how the means for linking actually operate, since the claim is silent as to which signal or control basis is used for linking the encoded signal records: is the linking made according to linking data stored with the programs, or according to predetermined control or address values generated with an algorithm or on the basis of tables during reproduction and/or on the basis of the selected record (or speed).

It is to be noted that it is not even clear from claim 9 how the plurality of speeds can be reproduced by the apparatus for which protection is sought: is there a record for each possible selected speed available, or is the speed obtained from various records by a specific method (e.g. temporal subsampling of images or frames of the video signal) of reading out the storing means, or both ? How is the size of a record related to the corresponding reproduction speed ?

Due to these deficiencies in claim 9, the conclusion set out above in connection with claim 1 is equally applicable in connection with claim 9.

4925

WO 93/31065

Replaced by Article 34

20 H000 PCT/JP 22 SEP 1997

PC/US96/02642

08/913803

1

TRICK-PLAY MODES FOR PRE-ENCODED VIDEO

This invention relates to digitally compressed video material and in particular to the provision this material at speeds other than at normal play speed.

5 The implementation of trick-play modes within digital video systems is a problem which is becoming more important as digital video-based systems enter the marketplace. Emerging consumer video products such as video on demand (VOD), video CDs, and other similar systems may compete with the VHS tape market as
10 providers of feature-length movies. However, unlike analog-based replay methods, digital video systems represent a challenge in the reproduction of video images at speeds other than normal play speed. Such "off speed" reproductions being known as trick-play which may provide images at various speeds, for example, fast-
15 forward, fast-reverse, freeze-frame etc.

Digital video compression based on the MPEG standard is becoming the format of choice for storage and transmission of digital video material. Unfortunately, unlike analog image reproduction, the provision of user selected trick-play operation, "on demand" and in
20 real time from a normal-speed MPEG video stream is relatively complex and computationally expensive.

An inventive method facilitates various trick-play modes by controlled selection of "replay" locations. The method allows successive selections to be decoded and displayed independently
25 from any previously selected video stream.

A method for reproducing video programs comprises the steps of:

identifying a digitally encoded set of signals in a storage medium for each one of a plurality of video programs for
30 reproduction of each one of said plurality of programs at a plurality of reproduction speeds;

linking each of the encoded signals in each of the sets to one another at predetermined jump points;

35 reproducing one of the encoded signals in response to selection of a program and a reproduction speed;

jumping to different ones of the encoded signals for the reproducing in accordance with the predetermined jump points, in

response to subsequent selections of different reproduction speeds; and,

decoding the reproduced signals for display of the selected program at the selected reproduction speeds.

5 FIGURE 1 shows table 1 which indicates advantageous bit rate and resolution differences for both normal and trick-play modes.

10 FIGURE 2 illustrates compressed video data streams representing normal play speed, twice play speed and ten times play speed.

 FIGURE 3 illustrates table groups for use in an inventive method for selecting between bit streams representing normal and trick-play reproduction speeds.

15 FIGURE 4 is a block diagram illustrating a system employing inventive features for selection and control of compressed digital video sources.

 FIGURE 5 is a flow chart illustrating operation of an inventive method of selection and control of compressed image streams for reproduction at normal and trick-play speeds.

20 This inventive method facilitate various trick-play modes by controlled selection of "replay" locations. Depending on the program storage medium a single stream may provide normal play speed and trick-play operation. However, the provision of both normal play speed and trick-play operation from a single program stream may result in trick-play speeds limited by the GOP size or I frame repetition rate. To provide a greater selection of trick-play speeds multiple program streams may be used with

30 a single stream for normal play speed operation with other streams providing a variety of fast-forward and fast-reverse trick-play modes. The image streams which provide the trick-play feature may not necessarily be encoded at the same bit-rate, and may not necessarily have the same resolution as the original image stream. The use of a significantly lower bit-rate and/or resolution for encoding trick-play image streams may offer savings benefits when
35 storage space and/or transmission costs are considered. In addition,

CLAIMS

- 1 1. A method for reproducing video programs, comprising
2 the steps of:
3 identifying (step 200) a digitally encoded set of signals
4 (NP TP1, -TP1, TP2, -TP2) in a storage medium for each one of a
5 plurality of video programs (P1, P2, Pn) for reproduction of each one
6 of said plurality of programs (P1, P2, Pn) at a plurality of
7 reproduction speeds;
8 linking each of said encoded signals
9 (NP, TP1, -TP1, TP2, -TP2) in each of said sets to one another at
10 predetermined jump points (step 500);
11 reproducing (step 275) one of said encoded signals
12 (NP, TP1, -TP1, TP2, -TP2) in response to selection of a program
13 (P1, P2, Pn) and a reproduction speed;
14 jumping (step 600) to different ones of said encoded
15 signals (NP, TP1, -TP1, TP2, -TP2) for said reproducing in accordance
16 with said predetermined jump points (step 500), in response to
17 subsequent selections of different reproduction speeds; and,
18 decoding (510) said reproduced signals for display
19 (1000) of said selected program (P1, P2, Pn) at said selected
20 reproduction speeds.
- 1 2. The method of claim 1, comprising the step of
2 arranging said jump points in a nested pattern (120).
- 1 3. The method of claim 1, comprising the step of
2 generating one signal (NP) of said digitally encoded set (NP, TP1, -TP1,
3 TP2, -TP2) of signals for reproduction at a normal play speed.
- 1 4. The method of claim 3, comprising the step of
2 generating the other ones (TP1, -TP1, TP2, -TP2) of said set for
3 reproduction at speeds other than said normal play speed.
- 1 5. The method of claim 4, comprising the step of
2 generating said other ones (TP1, -TP1, TP2, -TP2) of said set for
3 reproduction with a resolution less than a resolution of said one
4 signal for reproduction at said normal play speed.

1 6. The method of claim 4, comprising the step of
2 generating said other ones (TP1, -TP1, TP2, -TP2) of said set for
3 reproduction with a bit rate less than a bit rate of said one signal for
4 reproduction at said normal play speed.

1 7. The method of claim 1, comprising the step of
2 assembling said jump points as look up tables (120).

1 8. The method of claim 7, comprising the step of
2 arranging said look up tables in groups (NPG, TP1G, -TP1G, TP2G,
3 -TP2G) where each one of said groups of said look up tables is
4 specific to a reproduction speed.

1 9. An apparatus for reproducing video programs,
2 comprising:
3 means for storing (100, 101, (99+n)) a digitally encoded
4 set (NP, TP1, -TP1, TP2, -TP2) of signals each one of a plurality of
5 video programs (P1, P2, Pn);
6 means for linking (120) each of said encoded signals (NP,
7 TP1, -TP1, TP2, -TP2) in each of said sets to one another at
8 predetermined jump points;
9 means for reproducing (S1) one of said encoded (NP, TP1,
10 -TP1, TP2, -TP2) signals in response to selection of a program (P1,
11 P2, Pn) and a reproduction speed;
12 means for selecting (50) different ones of said encoded
13 signals (NP, TP1, -TP1, TP2, -TP2) for said reproducing in accordance
14 with said predetermined jump points, in response to subsequent
15 selections of different reproduction speeds; and,
16 means for decoding (510) said reproduced signals for
17 display (1000) of said selected program (P1, P2, Pn) at said selected
18 reproduction speeds.

1 10. The apparatus of claim 9, wherein said
2 predetermined jump points are grouped (NPG, TP1G, -TP1G, TP2G,
3 -TP2G) specific to transitions between differing reproduction speeds.

1 11. The apparatus of claim 9, wherein said
2 predetermined jump points represent addresses of digital images
3 which substantially correspond with one another in said encoded
4 signals (NP, TP1, -TP1, TP2, -TP2) in each of said sets.

1 12. The apparatus of claim 9, wherein said linking means
2 comprises tables (120) of said predetermined jump points.

1 13. The apparatus of claim 12, wherein said linking
2 means comprises N sets of tables (120), each set comprises (N - 1)
3 tables of said predetermined jump points for each of N reproduction
4 speeds.

1 14. The apparatus of claim 9, wherein said set of signals
2 (110) for reproduction at a plurality of speeds comprises records of
3 differing sizes.

1 15. The apparatus of claim 14, wherein a record for
2 reproduction at a normal play speed (NP) represents a largest byte
3 record.

1 16. The apparatus of claim 14, wherein records
2 (TP1, -TP1, TP2, -TP2) for reproduction at speeds other than a
3 normal play speed represent records smaller than said normal play
4 speed record (NP) and have sizes which decrease in proportion to
5 reproduction speed increase.

1 17. An apparatus for reproduction of compressed digital
2 images at a plurality of speeds, said apparatus comprising:
3 storage device (10) having stored therein a plurality of
4 compressed program records (P1, P2, Pn), each one of said records
5 (P1, P2, Pn) including different versions (NP, TP1, -TP1, TP2, -TP2) of a
6 program for reproduction of said program at different play speeds;
7 control means (50) responsive to a program selection for
8 selecting one of said records (P1, P2, Pn) and responsive to a play
9 speed selection for selecting a version (NP, TP1, -TP1, TP2, -TP2) of said

10 selected record for reproduction, decoding (510) and display (1000)
11 of said program.

1 18. The apparatus of claim 17, wherein said control
2 means (50) switches (S1) between said different versions (NP, TP1,
3 -TP1, TP2, -TP2) of said selected record (P1, P2, Pn), said version being
4 switched to initiate said different play speeds at a points in time of
5 said different versions which substantially correspond to one
6 another.

1 19. The apparatus of claim 17, wherein said control
2 means (50) switches (S1) between said different versions (NP, TP1,
3 -TP1, TP2, -TP2) of said selected record (P1, P2, Pn) to initiate said
4 different play speeds and allow successively selected versions (NP,
5 TP1, -TP1, TP2, -TP2) to be decoded independently from any previously
6 selected version.

1 20. An apparatus for reproduction of compressed digital
2 images at a plurality of speeds, said apparatus comprising:
3 storage device (10) having stored therein a plurality of
4 compressed program records (P1, P2, Pn), each one of said records
5 including different versions (NP, TP1, -TP1, TP2, -TP2) of a program for
6 reproduction of said program at different play speeds;
7 control means (50) responsive to a user program and
8 play selection for selecting a version (NP, TP1, -TP1, TP2, -TP2) of one of
9 said records (P1, P2, Pn), and additionally responsive to user
10 determined control of play speed selection for switching between
11 said different versions (NP, TP1, -TP1, TP2, -TP2) of said selected record
12 (P1, P2, Pn) such that a newly selected version (NP, TP1, -TP1, TP2, -TP2)
13 is reproduced from a time which precedes the preceding version.

1 21. An apparatus for reproduction of compressed digital
2 images at a plurality of speeds, said apparatus comprising:
3 storage device (10) having stored therein compressed
4 program records (P1, P2, Pn), and tables (120) of predetermined
5 addresses for use at different play speeds;

6 transducing means (51) for reproducing images from said
7 compressed program records (P1, P2, Pn); and,
8 control means (50) responsive to a user program and
9 play speed selection for selecting said program records (P1, P2, Pn),
10 and additionally responsive to user determined play speed for
11 reading said tables (120) and generating predetermined addresses
12 within said selected program records (P1, P2, Pn) for locating said
13 transducing means (S1) such that images are reproduced from said
14 program records (P1, P2, Pn) at said user determined play speed.